Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_

**Toothpickase Lab**

Ms. OK, PreAP Biology, 2014-2015

**Introduction:** In this activity, you will act as an enzyme called toothpickase breaking a substrate (a toothpick) into two pieces with your hands.

**Pre-Lab Questions:**

1. What is the active site in this simulation?
2. What is/are the product(s) in this simulation?

**Procedure:**

***The Materials***

1. A handful of toothpicks

2. A timing device of some sort (ex: the room clock, your phone, an actual watch)

3. About a foot (12 inches) of masking tape

***The Rules***

1. You must break each toothpick one at a time

2. You must break each toothpick with two hands ONLY.

3. You must break each toothpick completely in half.

4. You cannot begin before the teacher calls Go!

5. You must stop precisely when teacher says STOP!

6. You must keep your eyes closed throughout the entire activity.

***Part 1 Steps***

1. One person in your group will be the enzyme, one person will be the timer, and one person will be the recorder.

2. Every ten seconds for 60 seconds, record the total number of toothpicks broken. Stop if you reach 75 toothpicks.

3. At the end of the trial, clean up all your broken toothpicks and throw them in the trash can.

4. Calculate the average rate of reaction using the following equation

5. If you broke all 75 toothpicks before the 60 second mark, the denominator in the equation above should be the time it took you to break the 75 tootpicks.

***Part 2 Steps***

1. Use the same procedure as you did for Part 1, except this time, you must use the masking tape to stick your thumb and forefinger together on each hand.

**Data:**

***Part 1: Total # of Toothpicks Broken Over 60 Seconds***

|  |  |
| --- | --- |
| **Time (in seconds)** | **Total # of Toothpicks Broken** |
| 0 | 0 |
| 10 |  |
| 20 |  |
| 30 |  |
| 40 |  |
| 50 |  |
| 60 |  |

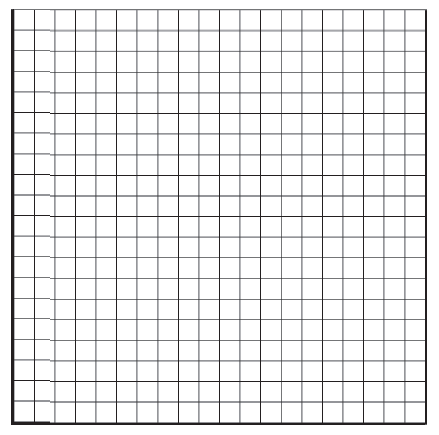
In the space given below, calculate the average rate of reaction (in toothpicks per second) for Part 1.

***Part 2: Total # of Toothpicks Broken Over 60 Seconds***

|  |  |
| --- | --- |
| **Time (in seconds)** | **Total # of Toothpicks Broken** |
| 0 | 0 |
| 10 |  |
| 20 |  |
| 30 |  |
| 40 |  |
| 50 |  |
| 60 |  |

In the space given below, calculate the average rate of reaction (in toothpicks per second) for Part 2.

***Graph:*** In the space below, draw a line graph showing total number of toothpicks broken at each 10-second interval from your data tables. You will have two lines—one for Part 1 and one for Part 2. Remember to include a title that describes both the X and Y axis, axis labels (with units in parantheses), a logical scale, and a key (to distinguish between your two lines).



**Discussion / Conclusion:** Include the following elements in your discussion / conclusion section (on a separate sheet of paper). Please break your response down into three parts—1,2, and 3.

1. You must identify the rate of reaction you calculated for Parts 1 and 2 and compare them (i.e., which is higher?). ***(2 points)***

Score: \_\_\_\_\_\_

2. You must explain why you saw the changes in the rate of reaction. What was different about the procedure in Parts 1 and 2? ***(2 points)***

Score: \_\_\_\_\_\_

3. You must how the changes to the Part 2 procedure relate to the changes that occur in an enzyme under extremely high temperature conditions. ***(2 points)***

Score: \_\_\_\_\_\_

4. You must explain how these changes to an enzyme under extremely high temperature conditions result in a change in the rate of reaction. ***(2 points)***

Score: \_\_\_\_\_\_